Forest Insects and Drought

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Types of Forest Insects

Bark Beetles

Defoliators

Wood Borers

Terminal Weevils

Aphids and Scales

Common Forest Insects

Mountain pine beetle

Red turpentine beetle

Western pine beetle

Pine engraver

Douglas-fir beetle

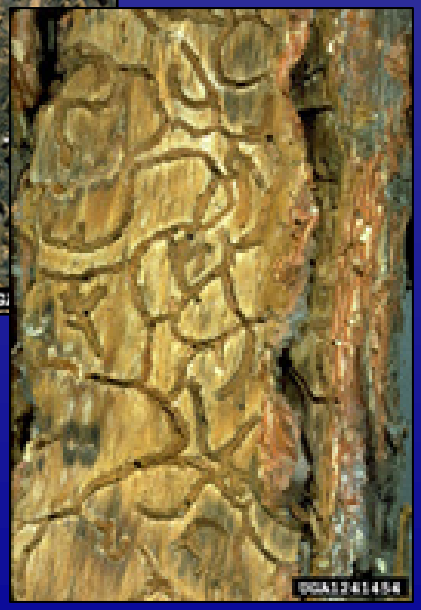
Spruce beetle

Fir engraver

Western balsam bark beetle

Western spruce budworm

Bark Beetle Impact



- Native insects
- Mass attack - pheromones
- Feed in cambium
- Sever circulatory system
- Introduce blue stain
- Kill trees outright

Tree Defense Mechanisms

Pressurized sap

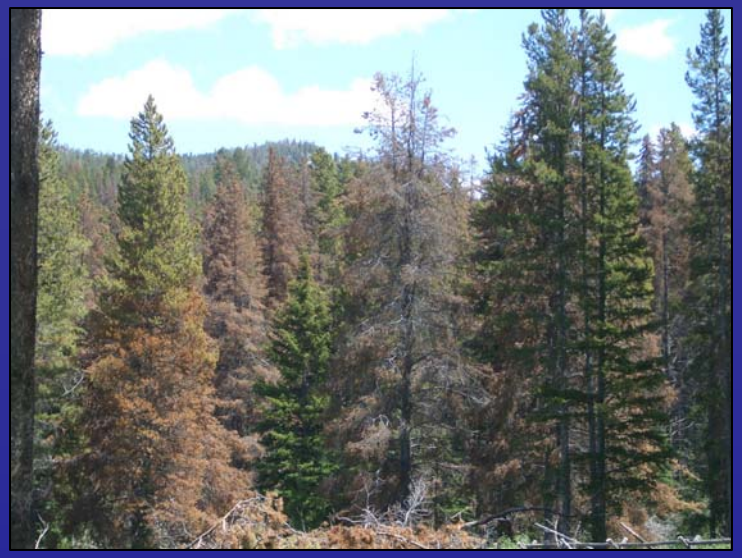
- "Pitch out"
- Resin flows

Requires moisture!

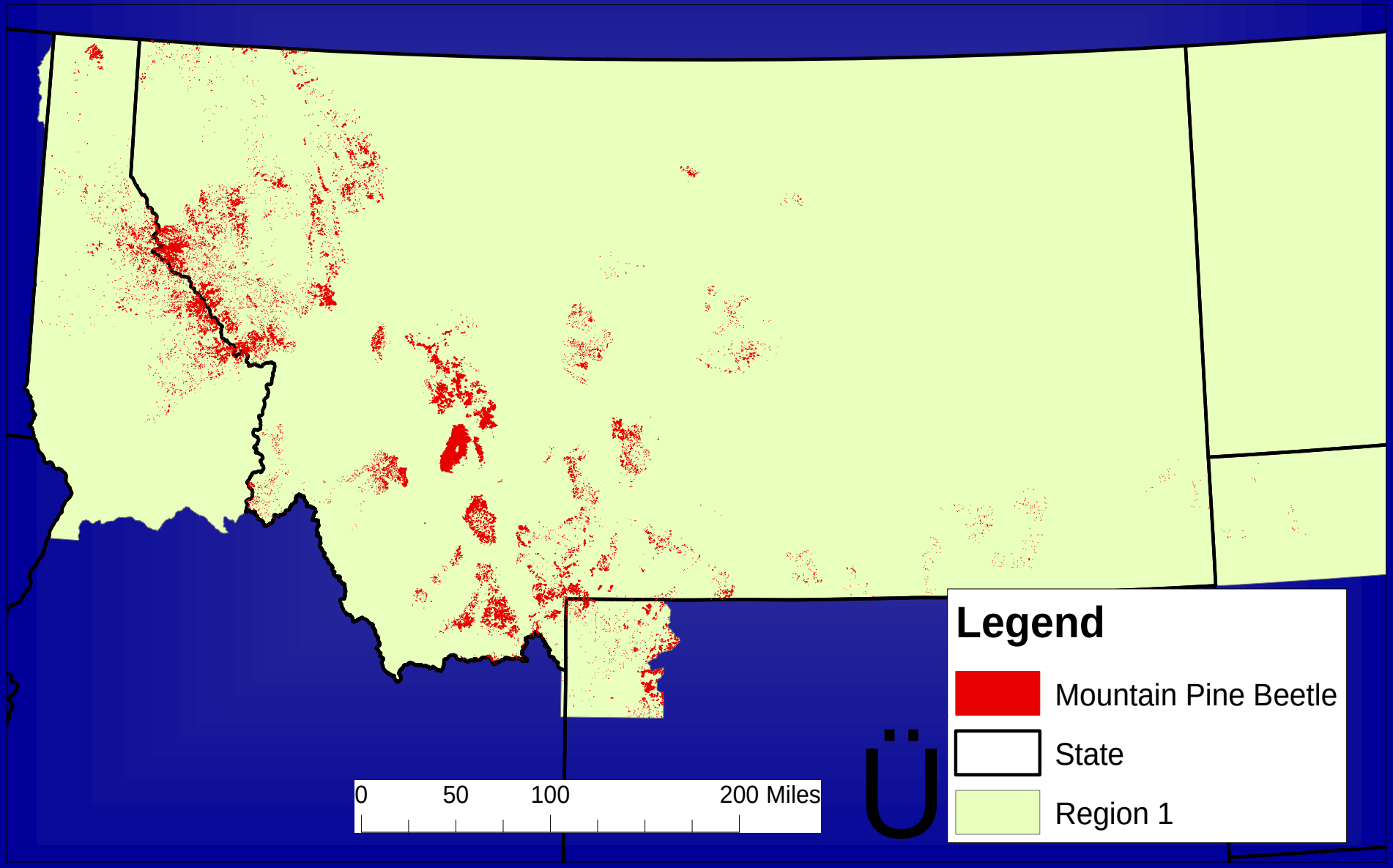
Drought - dry entry holes with only boring dust

Mountain Pine Beetle Ecology

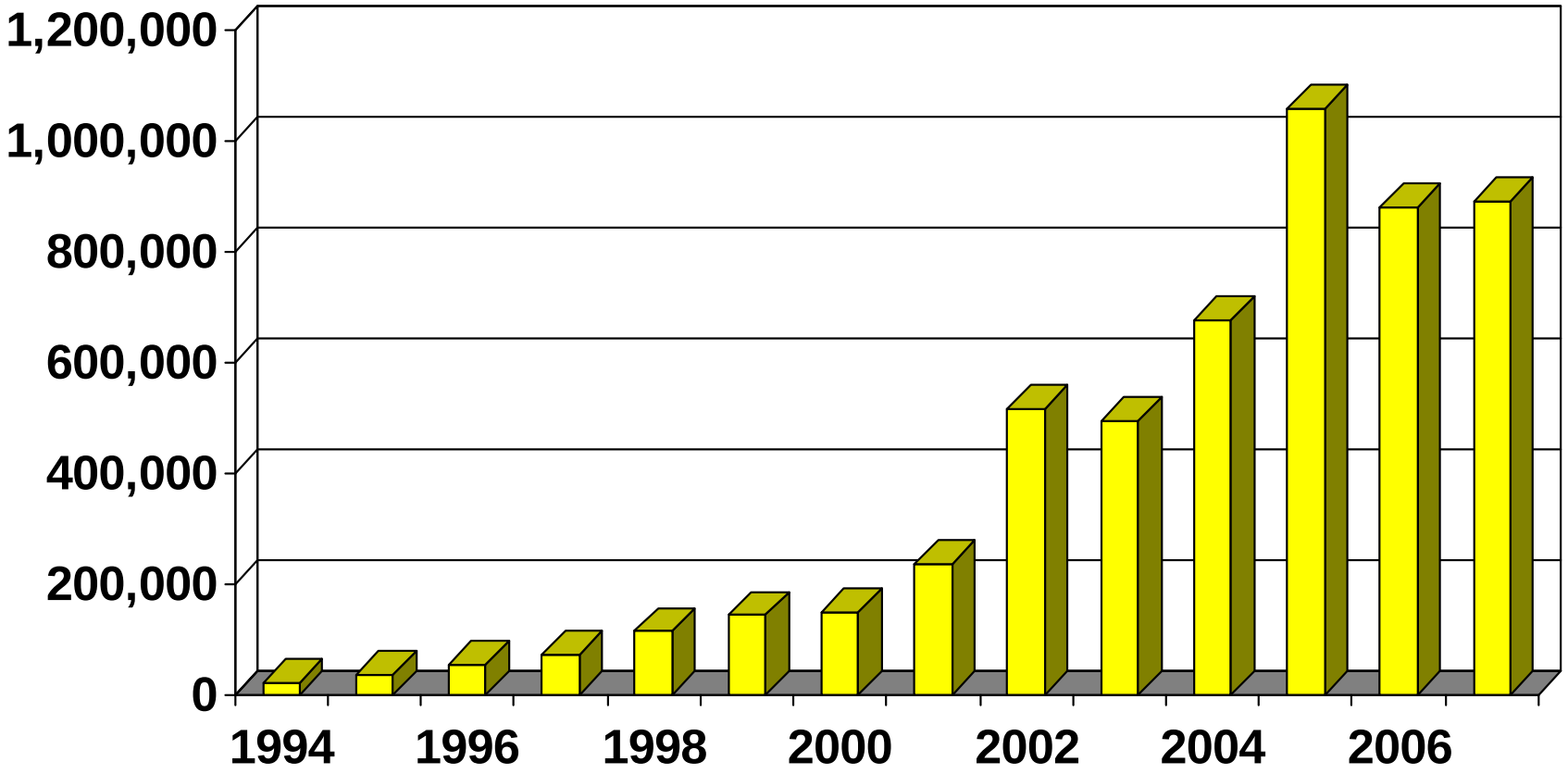
- All pine species
- Trigger event - outbreak
- Robust populations attack vigorous trees
- Landscape scale
- Abundant host!
- Lodgepole regeneration and disturbance cycle
- Ponderosa encroachment
- Climate and whitebark



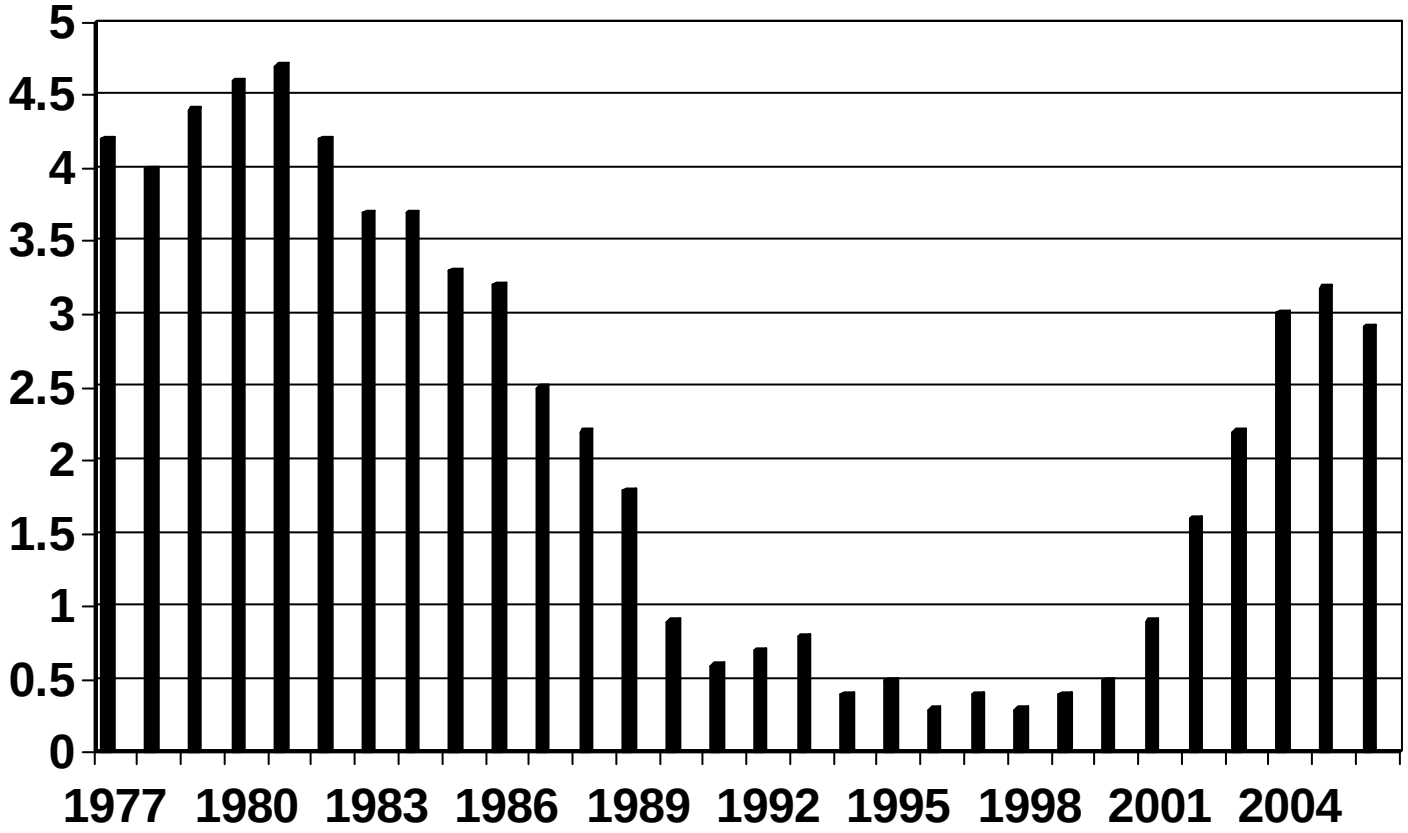
MPB Distribution 2007



MPB Population Trends 1994-2007



MPB Trends Western U.S. 1977-2007



Douglas-fir Beetle Ecology

Douglas-fir

Mature, decadent trees

Stressed trees

Trigger events = fire, wind

Robust populations attack vigorous trees

Abundant host

Douglas-fir shade tolerant

Fire exclusion promotes DF

Other Bark Beetles

- Various hosts – one for each tree species
- Commonly attack stressed trees
- Build up after drought, fire, wind events
- Climate affects life cycle
  - Spruce beetle

Defoliator Impact

- Feed on new foliage, buds
- Reduce photosynthetic capacity of tree
- Reduce radial growth
- Lateral dieback, top kill
- Deplete nutrient reserves
- Stress tree….. Bark beetles

Tree Defense Mechanisms

Chemistry

Phenology

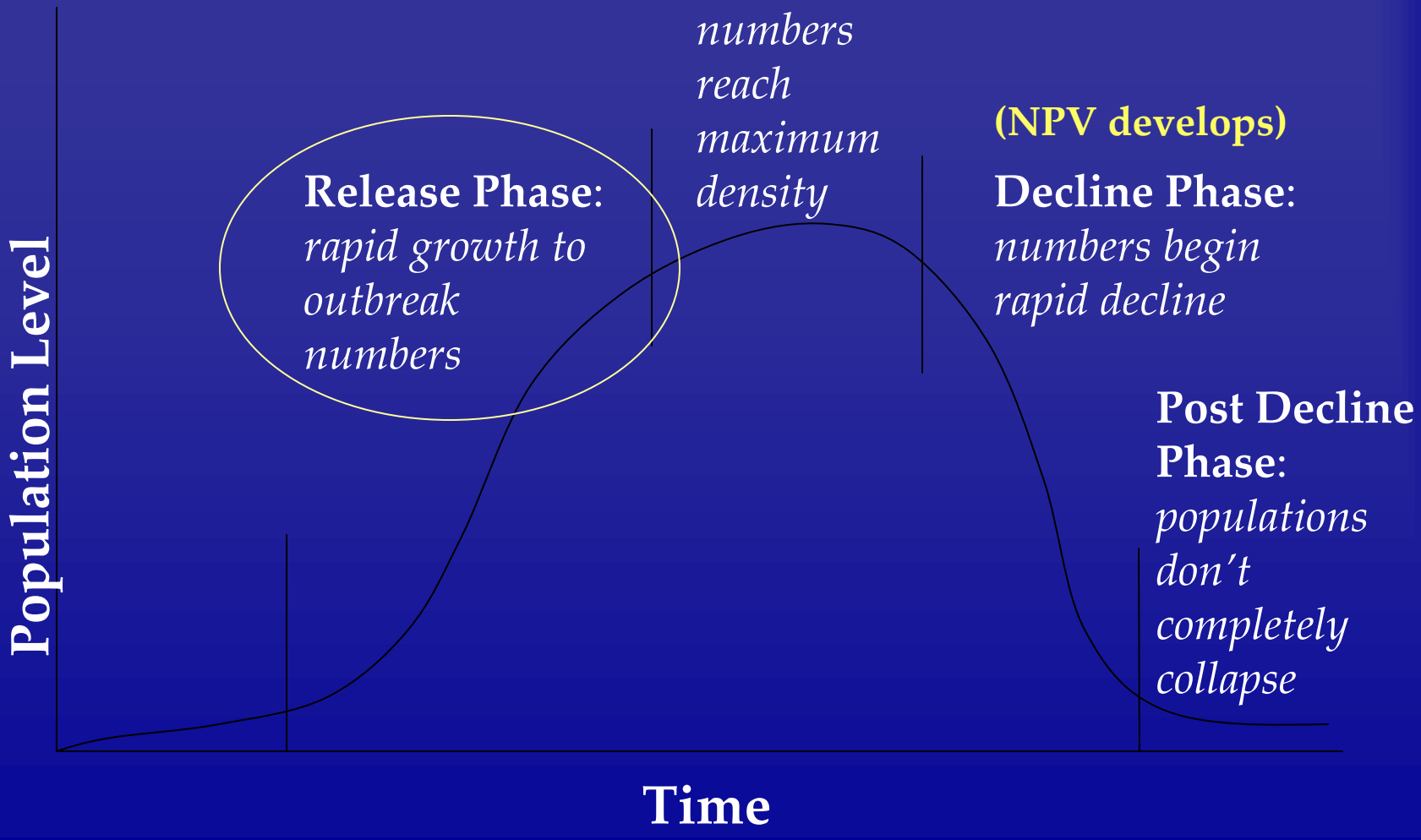
Draw on nutrient reserves

Western Spruce Budworm Ecology

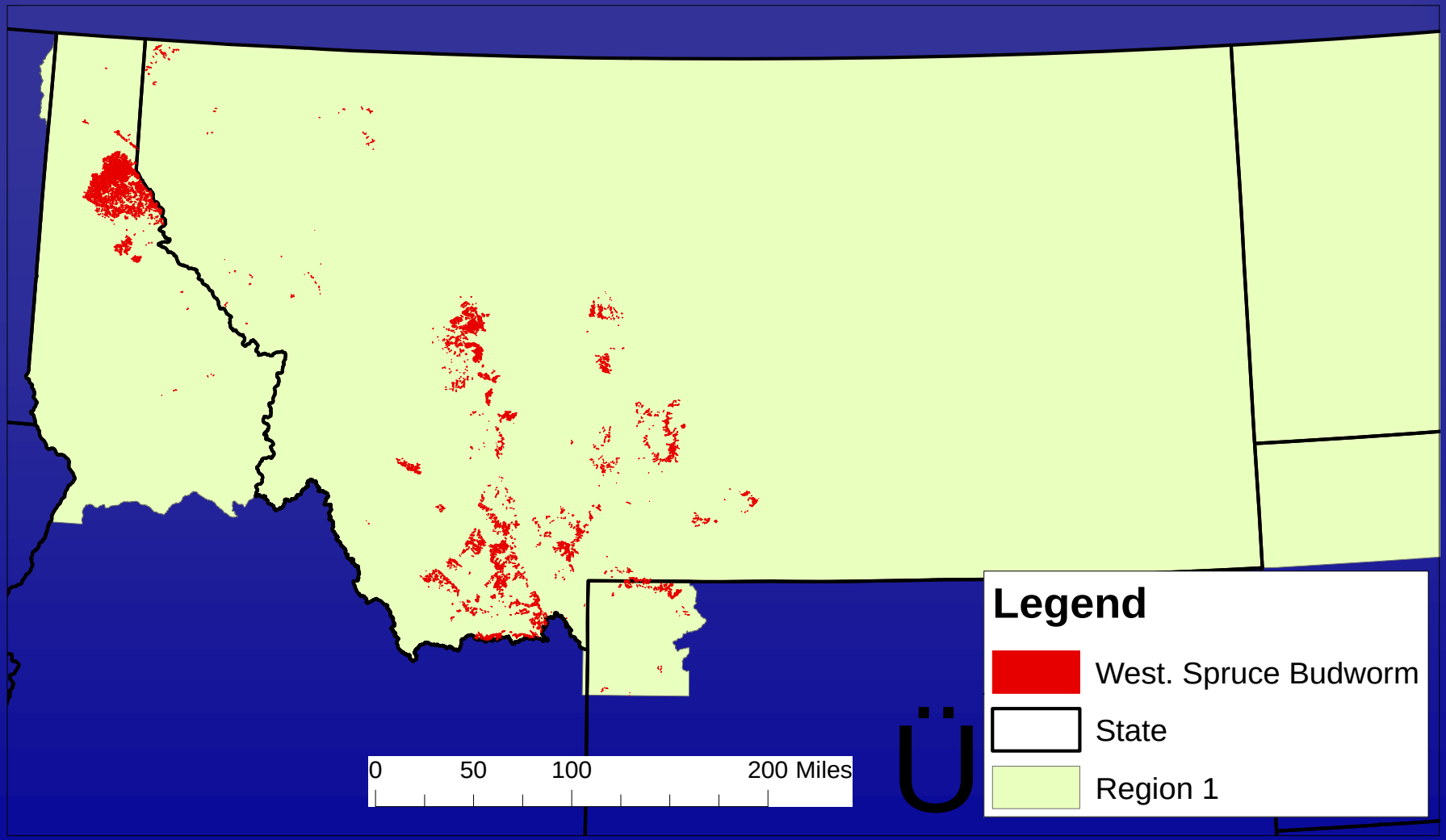
- Doug-fir, spruce, grand fir
- Prefer warm, dry sites
- Multi-storied stands promote distribution
- Chronic outbreaks
- Set back by spring frosts

- Abundant host
- Fire exclusion promotes host understory

WSBW Outbreak Characteristics

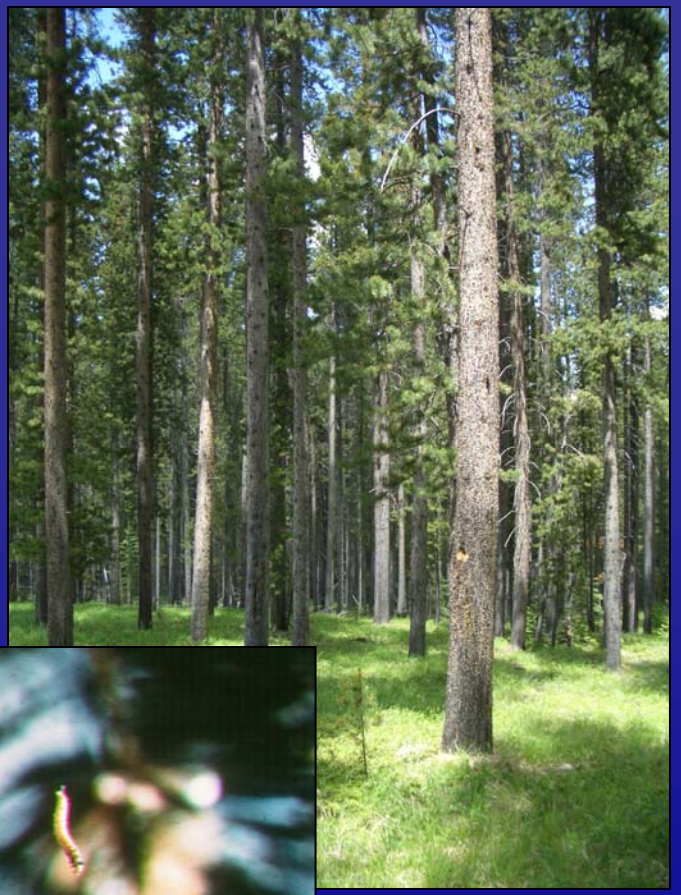


WSBW Distribution 2007



Management - thinning

- Change microclimate
  - Increase airflow
  - Increase temperature
  - Reduce humidity
- Change structure
  - Interrupt vertical distribution
  - Create patches



Management - thinning

Enhance resilience

Increase available water, nutrients, sunlight

Promote pressurized sap

Greater nutrient reserves in root system

Management - thinning

- Species composition
  - Interrupt host
  - Ensures residual trees
- Susceptibility
  - Promote age diversity
  - Identify most vulnerable

Management - chemical

Bark Beetles:

Preventive spray only!

Defoliators:

Spray on foliage

Only 1 yr efficacy

Management - chemical

Pheromones

- mimic “no vacancy” msg
- discourage mass attack
- only 1 yr efficacy

MPB: verbenone

DFB: MCH

Acknowledgements

USFS Aerial Detections survey

Ken Gibson, FHP Missoula

Forestry Images